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(54) **LIGHTING FIXTURE**

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F21V 21/02 (2006.01)
F21V 33/00 (2006.01)
F21Y 103/00 (2016.01)

(52) **U.S. Cl.**
CPC *F21S 8/033* (2013.01); *F21V 21/02* (2013.01); *F21V 33/006* (2013.01); *F21Y 2103/003* (2013.01)

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F21V 15/01; F21V 15/013; F21V 17/12;
F21V 17/10; F21V 17/16; F21Y 2103/003

See application file for complete search history.

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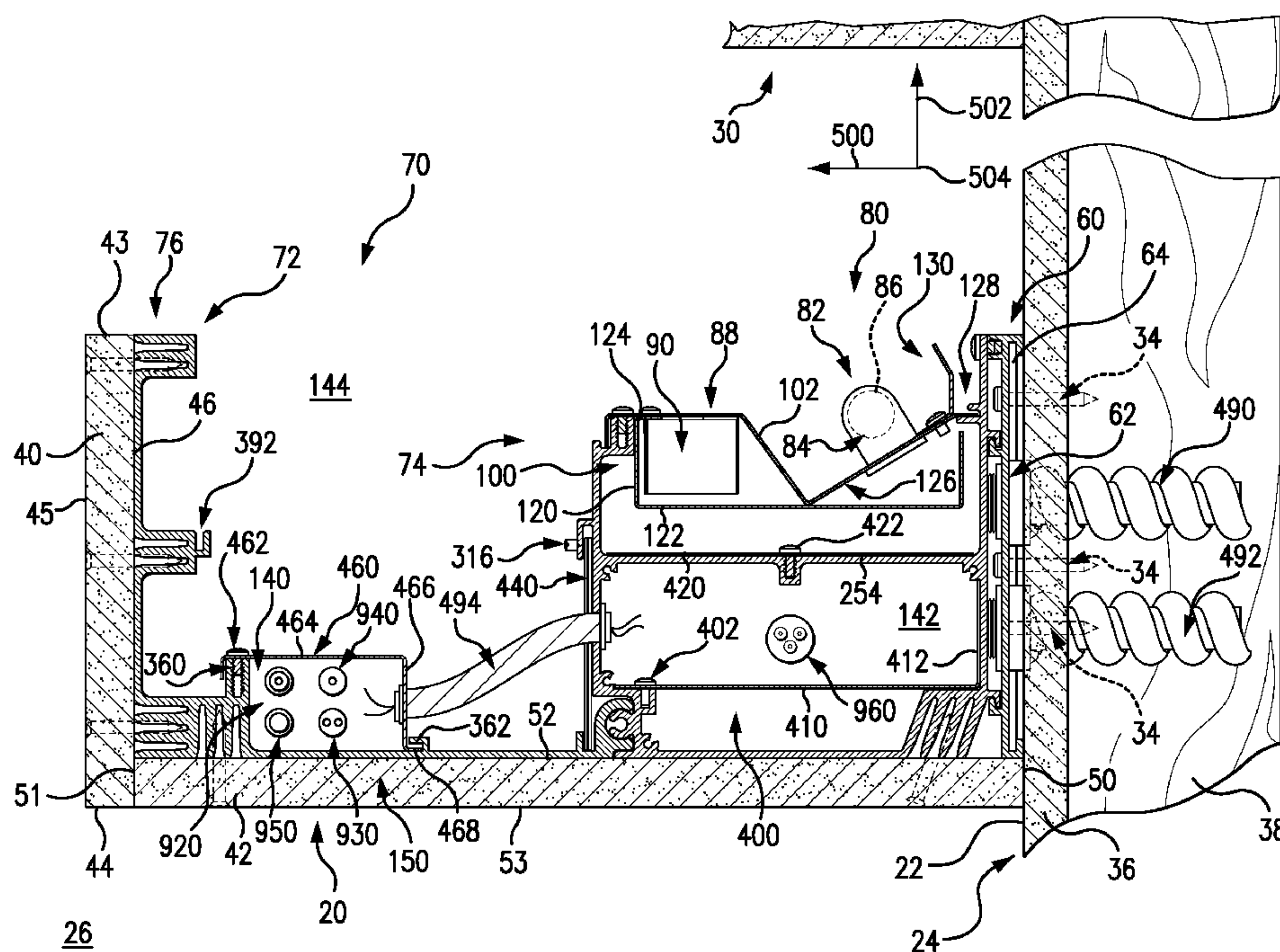
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(57) **ABSTRACT**

A light apparatus is mounted to a surface of a building and comprises: at least one elongate mounting member engaged to the surface; spaced-apart brackets mounted to the at least one elongate mounting member and extending forward therefrom; at least one light source mounted to a plurality of the spaced apart brackets; a forward trim mounted to the spaced-apart brackets; a lower trim mounted to the spaced-apart brackets; and a passageway. The passageway passes at least one of: a fluid line; an optical fiber; a communications line; and a power line not powering the at least one light source.

20 Claims, 5 Drawing Sheets



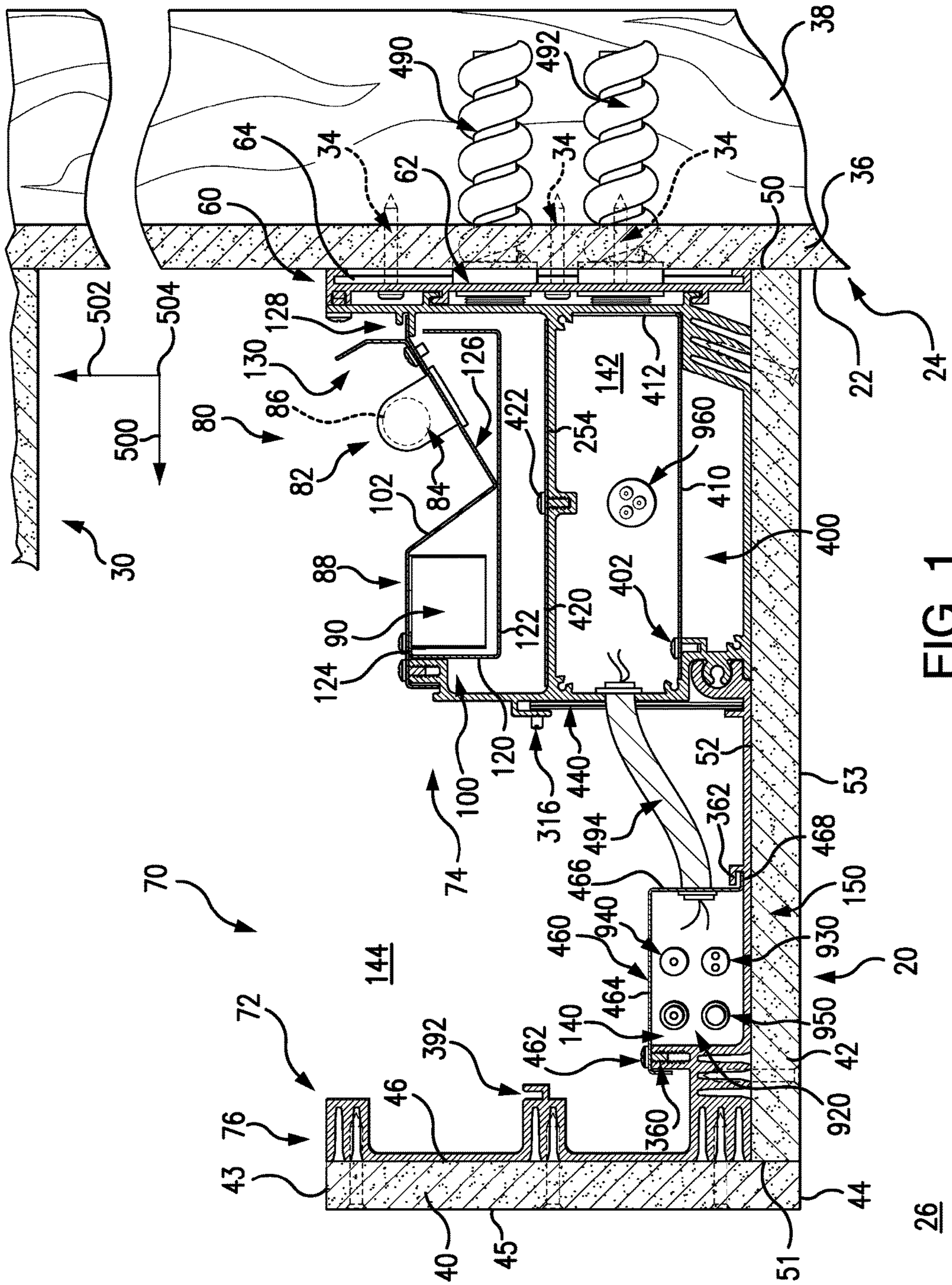


FIG. 1

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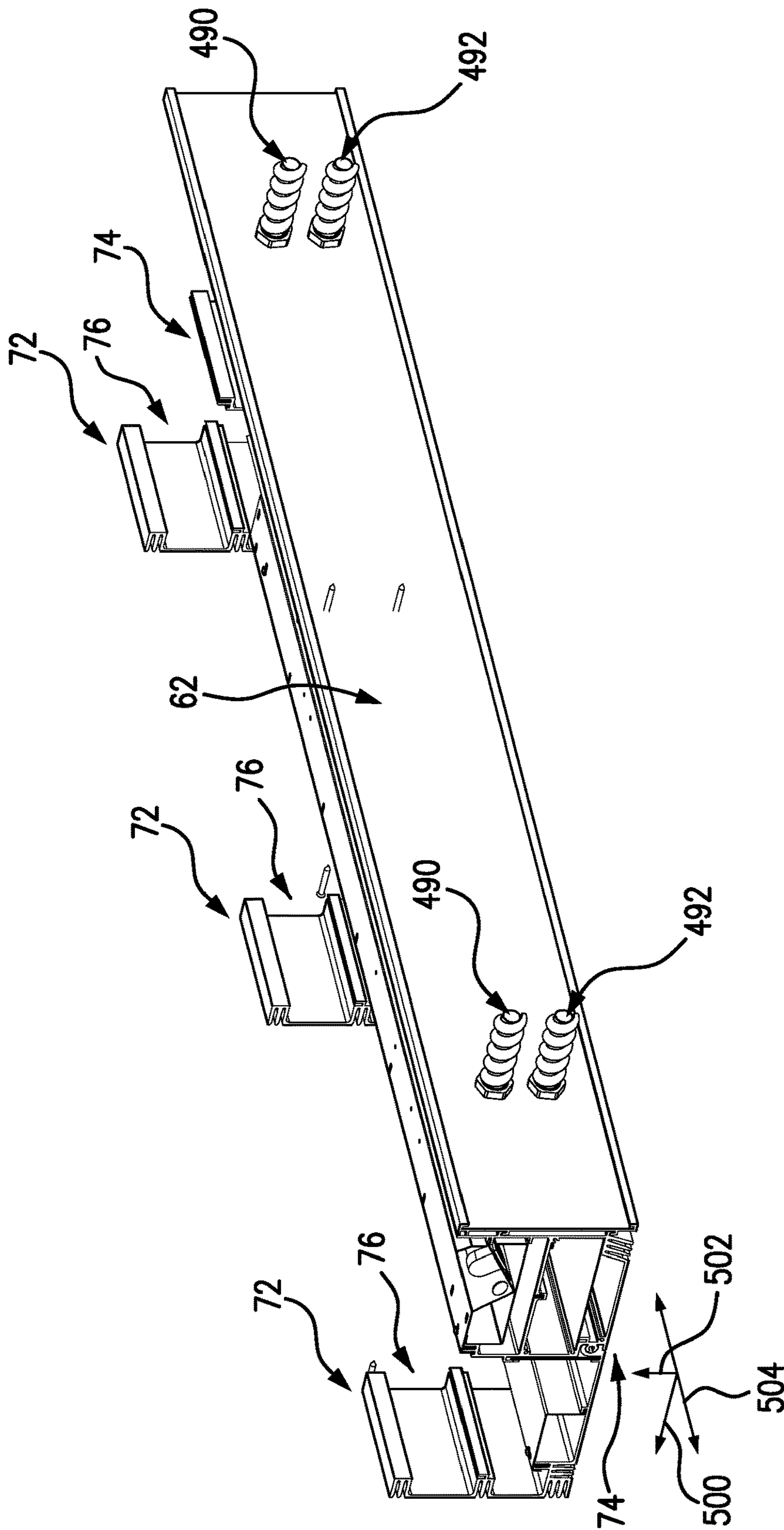


FIG. 2

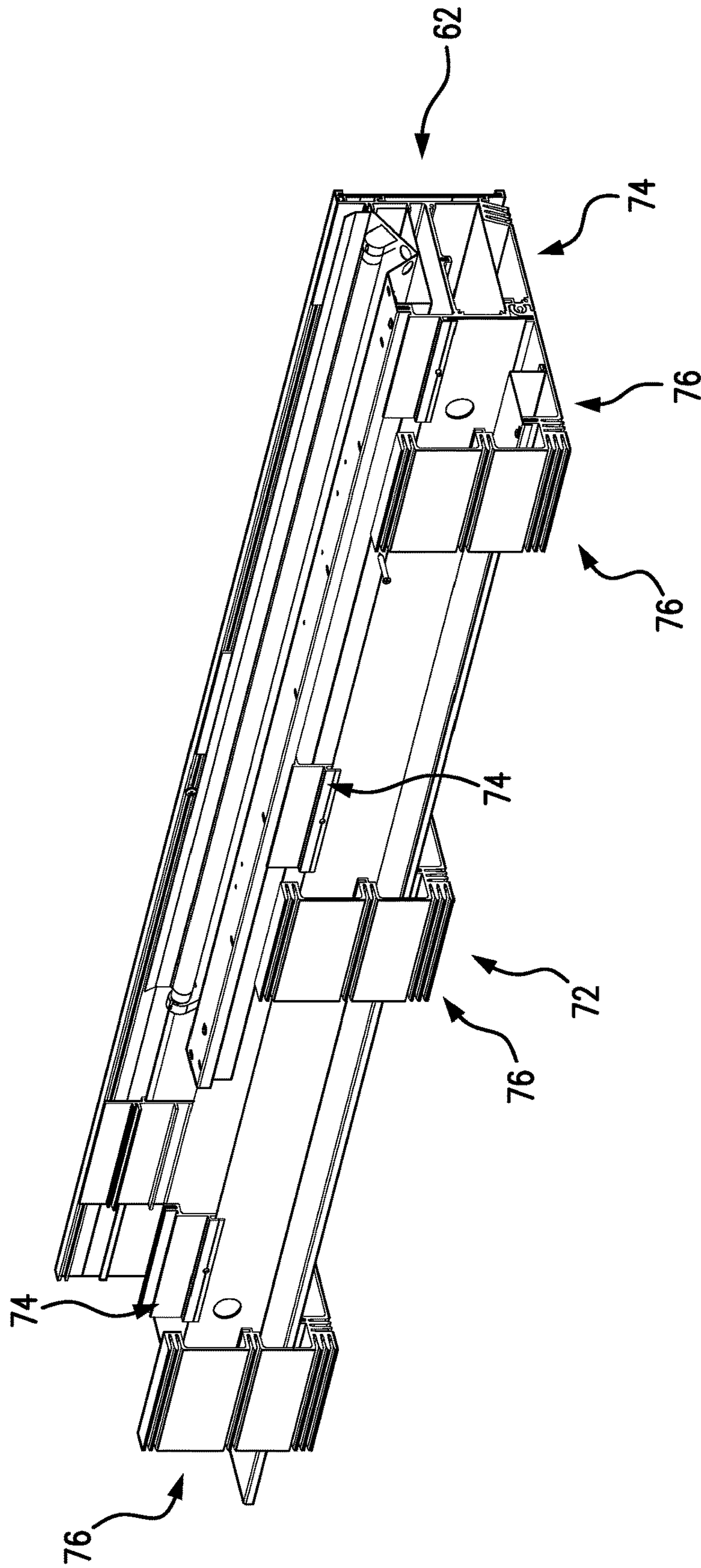
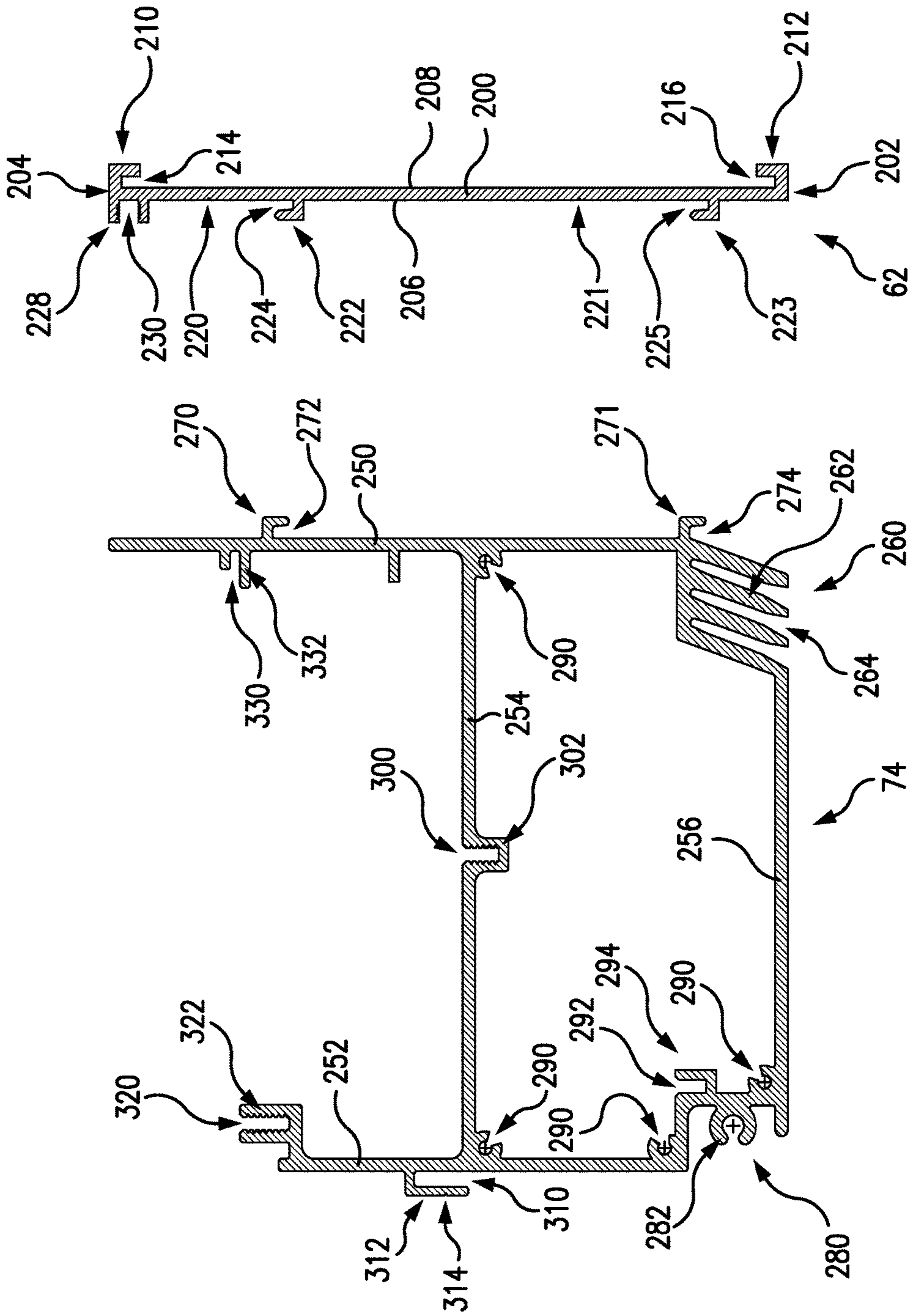


FIG. 3



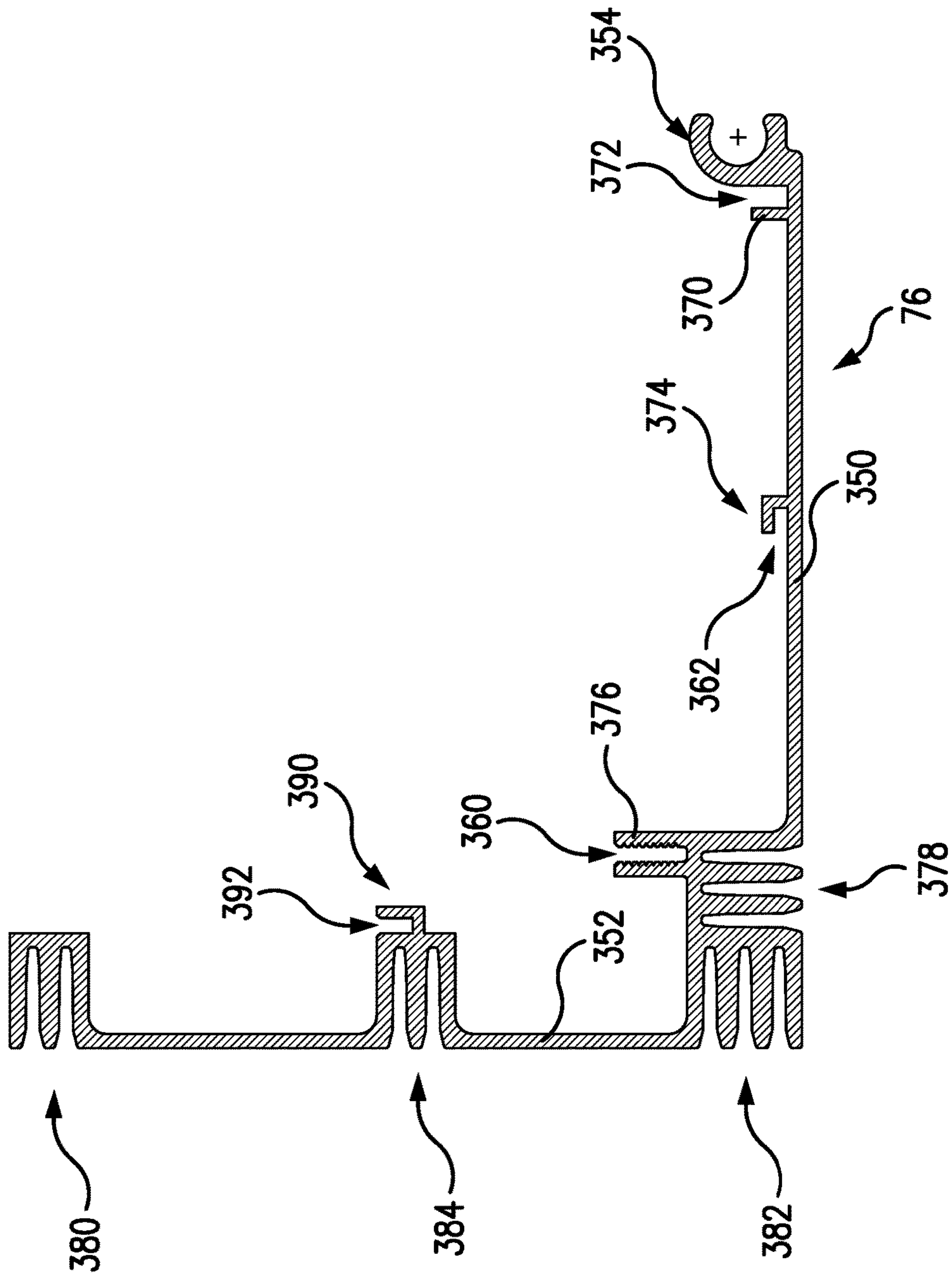


FIG. 6

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LIGHTING FIXTURE

CROSS-REFERENCE TO RELATED APPLICATION

Benefit is claimed of U.S. Patent Application No. 62/092,372, filed Dec. 16, 2015, and entitled "Lighting Fixture", the disclosure of which is incorporated by reference herein in its entirety as if set forth at length.

BACKGROUND OF THE INVENTION

The invention relates to electric lighting. More particularly, the invention relates to light fixtures for indirect lighting.

Well-developed fields exist in indirect lighting and architectural lighting fixtures. A particular area of indirect lighting is known as cove lighting. In a typical cove lighting situation, an upwardly open channel structure is built along a wall near the ceiling. The wall may be a side wall of the room, a sidewall of a recess in the ceiling, a side surface of a beam, or the like. Light bulbs are mounted within the channels so that the emitted light escapes generally upward to directly light the wall and ceiling above and, indirectly, an interior of the room and its contents. The channels are built with conventional building techniques involving framing, wallboarding/plastering, and the like.

Alternatives involve elongate fixtures used for cove lighting. Such fixtures typically include an elongate bulb within an elongate reflector positioned so that light from the bulb and reflector does not directly pass to objects within a room but, rather, is first diffusely reflected from a ceiling, wall, or other architectural feature. Such fixtures may be assembled end-to-end in lieu of placing fixtures within a preexisting channel. Exemplary systems are shown in U.S. Pat. Nos. 4,881,156, 5,550,725, 7,249,870 and 7,658,518.

SUMMARY OF THE INVENTION

One aspect of the disclosure involves a light apparatus mounted to a surface of a building and comprising: at least one elongate mounting member engaged to the surface; spaced-apart brackets mounted to the at least one elongate mounting member and extending forward therefrom; at least one light source mounted to a plurality of the spaced apart brackets; a forward trim mounted to the spaced-apart brackets; a lower trim mounted to the spaced-apart brackets; and a passageway. The passageway passes at least one of: a fluid line; an optical fiber; a communications line; and a power line not powering the at least one light source.

Other aspects involve a kit for forming such an apparatus.

Other aspects involve a method for forming such an apparatus.

The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical front-to-back sectional view of a lighting fixture.

FIG. 2 is a first view of a fixture module of the fixture of FIG. 1.

FIG. 3 is a second view of the fixture module.

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FIG. 4 is a sectional view of a mounting extrusion of the fixture.

FIG. 5 is a sectional view of a rear bracket extrusion of the fixture.

FIG. 6 is a sectional view of a front bracket extrusion of the fixture.

Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

FIG. 1 shows a light fixture assembly **20** mounted to a surface **22** of a building. The surface may be a surface of a wall **24** of a room **26**, a wall of a ceiling cove, a side of a structural beam, or the like. A cove may be above a main portion of the room. The fixture assembly may be positioned adjacent to and slightly below a ceiling or ceiling portion **30**. For convenient reference, a forward direction **500** is defined as away from the wall. An upward direction is shown as **502**. With left and right defined from the point of view of a person standing upright and facing in the forward direction, the fixture assembly may extend from a left end to a right end. The assembly may include one, two, or more individual fixture units or subsystem units assembled or otherwise arranged end-to-end. This bi-direction **504** of assembly is identified as longitudinal.

The exemplary fixture assembly **20** is shown in an exemplary mounting situation mounted (e.g., screwed **34**) directly to the wall **24**. The exemplary wall comprises wallboard **36** (e.g., gypsum board, plasterboard, or the like) on studs **38** (e.g., dimensional lumber or metallic substitute). Additional wallboard **40** extends as a forward/front trim partially along the front of the fixture. Additional wallboard **42** extends as a lower/bottom trim along the bottom. The wallboard **40** extends from an upper edge **43** to a lower edge **44** and has front **45** and aft **46** surfaces. Similarly, the wallboard **42** extends from a rear edge **50** to a front edge **51** and has upper **52** and lower **53** surfaces. In the longitudinal direction **504**, the wallboard **40** and **42** may be represented by multiple end-to-end pieces ultimately secured via conventional techniques.

The assembly **20** may comprise several subsystems. A first exemplary subsystem is a wall-mounting subsystem **60**. The exemplary subsystem **60** includes an end-to-end array of mounting members **62** (see also, FIG. 4). Exemplary mounting members **62** are extrusions (e.g., of an aluminum alloy) having a convoluted profile so as to form the gross features shown and described below. Adjacent members **62** are joined by connector plates **64** (e.g., aluminum, steel, or plastic) spanning their junctions. The members **62** may be secured to the wall **24** by the fasteners **34** (e.g., screws, toggle fasteners, or the like). Further structural details of the exemplary subsystem **60** and its members **62** are discussed below.

A second subsystem is a support bracket subsystem **70** that mounts to the wall-mounting system **60** and, in turn, supports other subsystems and components. The bracket subsystem **70** comprises a plurality of brackets **72** spaced laterally apart on the wall-mounting subsystem **60**. Each of the exemplary brackets **72** comprises a rear portion formed by a rear piece/member **74** (see also, FIG. 5) and a forward portion formed by a forward piece/member **76** (see also, FIG. 6). Details of these exemplary members are discussed further below. The segmentation into separate pieces **74** and **76** allows ease of manufacture via small extrusion equipment (rather than requiring large extrusion equipment to extrude the brackets **72** as a single piece).

A third subsystem is an electrical subsystem **80** (FIG. 1). The exemplary electrical subsystem includes a light source **82**. An exemplary light source may include one or more receptacles **84** mounting/carrying bulbs **86** (e.g., fluorescent tubes) for emitting light. Alternatives include light emitting diode (LED) strips. The receptacles are mounted on and carried by a gear tray **88** which in the exemplary embodiment is attached to the rear piece **74**. In FIG. 1, a ballast **90** is shown carried by the tray **88**. Receptacle/tray/ballast combinations may be longitudinally arrayed spaced apart end-to-end with a spacing associated with the desired density of light. In several alternative variations, a single ballast may power more than just the adjacent bulb(s). In other variations, there may be more complex interrelationship of the bulbs such as longitudinal staggering of receptacles for conventional tubes to reduce dark spots. Various permutations of known and unknown electrical connections may be used to connect the ballasts to external power (potentially including various daisy chaining of individual units, slaving of individual units, and the like). Additionally, alternative light sources may include light emitting diode (LED) strips or other lighting technologies instead of fluorescent tubes.

As is discussed further below, the exemplary gear tray **88** comprises a lower member **100** and an upper member **102**. The lower member **100** serves to enclose the wiring and the connections. The lower member **100** has a forward wall **120** and a lower wall **122** extending aft from a bottom end of the forward wall. The lower member has an upper web **124** extending rearward from an upper edge of the forward wall above the ballast. The upper member **102** extends rearward over the ballast and downward having a portion **126** mounting the receptacles and then terminating in a rear portion **128** mated to the bracket **72** (rear piece **74**). The exemplary gear tray includes a reflector **130** mounted to the upper member behind the receptacles.

As is discussed further below, the system may define several passageways **140**, **142** for passing various utilities and a compartment **144** (e.g., a forward upwardly-open bay) for accommodating various additional components.

A fourth subsystem is a trim subsystem **150** mounted to the wall-mounting subsystem and blocking the other subsystems from normal view by room occupants. This exemplary trim subsystem includes the forward trim **40** and the lower trim **42**. The exemplary wallboard trim members may be screwed to the brackets **72** by screws having threaded shanks captured in channels (discussed below) of the brackets. Various other wallboard artifacts may include tape, skim coats, finish coats, wall paper, and the like. Alternative trim members may comprise wood and/or veneer.

The exemplary pieces **62**, **74**, and **76** are each extruded of aluminum alloy and cut to length (e.g., 1 inch to 8 inches).

In cross-section, the pieces **62** (FIG. 4) have a vertical web **200** extending from a lower edge **202** to an upper edge **204** and having a front face **206** and a rear face **208**. At the upper and lower edges, respective top and bottom, L-shaped portions **210** and **212** form respective channels **214** and **216** facing each other for capturing associated top and bottom edge portions of the plates **64**.

Along the front face **206**, the web has respective upper and lower shallow grooves **220**, **221** for locating the fasteners **34**. It also has a pair of L-shaped portions **222** and **223** forming respective channels **224** and **225** facing upward for capturing associated portions of the piece(s) **74** for mounting the brackets **72**. At the upper end, the front face bears a pair of forward lips **228** defining a forwardly-open channel **230** (e.g. with grooved walls for engaging threads of a screw (FIG. 1)).

In cross-section, the pieces **74** (FIG. 5) have a vertical rear web **250** (extending between upper and lower edges and having front and rear faces) and a vertical forward web **252** (extending between upper and lower edges and having front and rear faces). These are joined by a transverse web **254** (extending between front and rear ends and having upper and lower faces). A lower web **256** extends aft from a forward edge and terminates in a channel array **260** joining a lower edge of the rear web. The channel array **260** has alternating angled walls **262** and channels **264** angled off vertical to facilitate receipt of the screws securing a rear portion of the lower trim.

Protruding from the rear face of the rear web **250** a pair of L-shaped portions **270** and **271** forming respective channels **272** and **274** facing downward for capturing (or being captured by the L-shaped portions **222** and **223** of the piece **62**).

A junction **280** of the forward web **252** and lower wall **256** comprises a feature **282** for mating with a complementary feature of the forward piece **76**. FIG. 5 further shows the piece **76** including a plurality of C-shaped features **290** for receiving optional screws (not shown) for attaching an end plate (not shown) at a free end (if any of the fixture).

The exemplary passageway **142** (FIG. 1) is bounded bottom and rear by bent sheetmetal plates **400**. Exemplary material for these and other sheetmetal plates discussed below is steel (e.g., galvanized or painted) cut and bent to shape. Adjacent end portions of these plates may nest/overlap. Fasteners (e.g., screws) **402** may extend through holes (round or longitudinally elongate slots) in the plates **400** and into associated upwardly open channels **292** (FIG. 5) formed by portions **294** of the rear bracket portion **74**. In this example, the channel **292** is upwardly open at a front of a lower horizontal portion **410** of the plate. The plate has a vertical rear wall **412** extending upward from a bend joining the portion **410**.

The exemplary passageway **142** is bounded at the top by sheetmetal plates **420**. Adjacent end portions of these plates may overlap. The plates **420** sit atop the web **254**. Fasteners (e.g., screws) **422** may extend through holes (round or longitudinally elongate slots) in the plates **420** and into associated upwardly open channels **300** (FIG. 5) formed by portions **302** of the webs **254**.

The exemplary passageway **142** is bounded at the front by sheetmetal plates **440** (FIG. 1). Adjacent end portions of these plates may overlap. Upper and lower edge portions of the plates are captured in channels of the brackets. In the illustrated example, the upper edge portions are captured by downwardly open channels **310** (FIG. 5) formed by L-shaped portions **312** along the front face of the front wall **252** of the piece **74**. A front surface of a distal leg of the L bears a groove **314** for registering drilling of a pilot hole to accommodate a set screw **316** (FIG. 1). The set screw locks the plate(s) engaged to the piece **74** (e.g., compressing against the wall **252** front face). Loosening of the set screws allows the plates to be slid past each other to open up access to the passageway **142**.

FIG. 5 further shows the piece **74** as having an upwardly-open channel **320** formed by a pair of upward walls **322** at the upper end of the wall **252**. The exemplary channel has grooved sides for receiving a screw (FIG. 1) mounting a forward portion of the gear tray. FIG. 5 also shows a forwardly open channel **330** formed by lips **332** capturing a rear edge portion **128** (FIG. 1) of the gear tray.

The exemplary front piece **76** (FIG. 6) has a lower horizontal web **350** (extending between front and rear edges and having upper and lower faces) and a vertical forward

wall **352** (extending between upper and lower edges and having front and rear faces). At the rear edge or end of the lower web, the front piece **76** bears a feature **354** for engaging the feature **282** in this example, the features **282** and **354** are respective smaller and larger c-sectioned features dimensioned for the feature **282** to closely nest within the larger feature **354**. The two features may snap into engagement via compressing or may be laterally slid into engagement. Once engaged, relative rotation of the two pieces is prevented. Exemplary widths of the pieces **74** and **76** is 1 inch to 8 inches. In one example, both are 4-6 inches. They may be of equal widths (lengths when cut from the initial extrusions) or they may be of different widths (e.g., for strength the rear pieces **74** may be wider than the front pieces **76**).

The exemplary passageway **140** is bounded top and rear by bent sheetmetal plates **460** (FIG. 1). Adjacent end portions of these plates may nest/overlap. Fasteners (e.g., screws) **462** may extend through holes (round or longitudinally elongate slots) in the plates **460** and into an associated channel **360** of the forward portion **76**. In this example, the channel portion **360** is upwardly open at a front of an upper horizontal portion **464** of the plate. The plate has a rear wall **466** ending in a rear foot **468** received in another channel **362** of the bracket forward piece or portion **76**.

Thus, the exemplary passageway **140** is bounded along the bottom by the trim **42** and along the front is essentially open to the bay **144** but with the opening spaced behind the trim **40** and thus relatively protected. Thus, if the passageway **140** is used to carry low or no voltage components (e.g., discussed below) this openness is acceptable.

FIG. 6 shows further details of the exemplary extrusion forming the front piece **76**. Spaced slightly ahead of the feature **354**, a vertical wall or lip **370** extends slightly upward from the web **350** and defines a channel **372**. This channel captures the lower edges of the plates **440** of FIG. 1 cooperating with the channel **310** of FIG. 5 opposite thereto and directly above.

FIG. 6 also shows an L-sectioned portion **374** extending upward from the web **350** to cooperate therewith to define a channel **362**. FIG. 6 also shows a pair of upwardly-projecting lips **376** forming the channel **360** and being extruded with grooved faces for improved screw engagement. FIG. 6 further shows a lower generally downwardly directed channel and wall array **378** near the front of the piece for receiving screws for fastening the trim **42**. Along the forward wall **352**, there are upper, lower, and intermediate forwardly open channel and wall arrays **380**, **382**, and **384** for receiving screws fastening the trim **40**. The combination of channel arrays **378** and **372** form a junction between the lower web **350** and the forward wall **352**. The forward wall **352** also bears an L-shaped projection **390** defining a channel **392**. In this example, the projection **390** extends rearward from a base of the channel/wall array **384**. The channel **392** is upwardly open and may receive fasteners (not shown) or other mounting features of equipment mounted in the bay **144** of FIG. 1.

Exemplary utilities passing through the passageways **140** and **142** include low or no voltage components and non-low voltage wiring. Exemplary low voltage components include: communications wiring **920** (FIG. 1, e.g., RF coaxial cable; telephone wiring, network wiring, control wiring such as for cameras and displays, other audio and/or video signals or controls therefor, signal lines for safety detectors (e.g., smoke, fire/heat, and/or carbon monoxide) or security system components, signal wires for lighting control (e.g., dimming) and the like); and low voltage power supply lines

or wiring **930** (e.g., for emergency lighting, signage, or powering accessories such as cameras, sensors (e.g., occupancy sensors), and the like). Exemplary non-voltage components include fiber optic lines **940** (e.g., carrying any of the aforementioned signals) and fluid lines or conduits **950** (e.g., delivering fluid for fire suppression or acting as a room air return for HVAC).

An exemplary non-low voltage line in the passageway **142** is a power line **960** not powering the at least one light source of the associated fixture. For example, it could power other lighting fixtures or could otherwise provide power for additional circuits. This may be particularly relevant in a retrofit of an existing building to minimize the number of wiring penetrations of the building walls.

FIG. 1 also show one or more conduits **490** carrying power lines through the pieces **62** to the lights. One or more conduits **492** carry power lines or other lines through the pieces **62** to passageway **142**. One or more conduits **494** carry power or other lines between the passageways **140** and **142**. Holes for these conduits may be pre-drilled in the various plates and pieces **62**.

In yet other variations, additional light sources may be added. For example, downlight sources could be positioned in or below the passageway **142**.

Other conventional features may be added. For example, these include corner transitions between linear runs of the fixture, end caps, and the like.

The accessory well (shown above the low/no voltage passageway **140**) may contain systems coupled to lines within the low/no voltage passageway. Such system components may include cameras, sensors (e.g., daylight harvesting sensors, occupancy sensors, safety detector sensors such as smoke, fire/heat, and/or carbon monoxide, or climate control sensors such as general temperature sensors or humidity sensors).

For installation, long lengths of the wall mounting members **62** may be screwed to the wall end-to-end joined by the connector plates **64**. Exemplary lengths may be three feet or greater, more particularly, six feet to twelve feet. For shorter linear runs (or linear segments of a run having turns) longer members **62** may be cut to length. The members **62** may be cut to length to make up the difference at the end of any longer leg (e.g., a twelve foot leg may be formed by an eight foot piece and another four foot segment cut from an eight foot piece). With these fastened to the wall, the brackets may be installed spaced as desired. Spacing may reflect structural concerns of supporting the weight of the entire finished fixture and may reflect concerns of providing brackets in the correct positions to mount the desired number of gear trays. As noted above, the number of gear trays and the spacing/gap therebetween may be influenced by the desired light intensity. When installing the brackets, the rear pieces **74** may be installed first by a downward translation to mate the respective features of pieces **74** and members **62**. If not predrilled for fasteners to engage the channels **230**, the holes may then be drilled in the rear pieces. The fasteners may then be secured. Depending upon situation, gear trays, plates, etc. may be added at this point or later. The front pieces may be assembled to the rear pieces. The trim may be installed.

In one exemplary situation where it is desired to do mechanical work first, the installation of the gear trays and wiring or other utilities in the passageways may be performed after mechanical assembly that includes attaching the trim members.

One or more embodiments of the present invention have been described. Nevertheless, it will be understood that

various modifications may be made without departing from the spirit and scope of the invention. For example, various elements may be combined or further separated. Additionally, a variety of structural shapes and cooperating features of the extrusion are possible. Various other manufacturing techniques and materials may be used. Multiple bulb and multiple reflector embodiments are also possible. Architectural/design considerations may influence any particular implementation, giving rise to the possibility of mounting on non-vertical surfaces and mounting in non-horizontally extending arrays. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. A light apparatus mounted to a surface of a building and comprising:
 - at least one elongate mounting member engaged to the surface;
 - spaced-apart brackets mounted to the at least one elongate mounting member and extending forward therefrom;
 - at least one light source mounted to a plurality of the spaced apart brackets;
 - a forward trim mounted to the spaced-apart brackets;
 - a lower trim mounted to the spaced-apart brackets; and
 - a passageway above the lower trim and behind the forward trim and passing at least one of:
 - a fluid line;
 - an optical fiber;
 - a communications line; and
 - a power line not powering the at least one light source.
2. The apparatus of claim 1 wherein:
 - the surface is a wall;
 - the at least one elongate mounting member extends essentially horizontally along the wall; and
 - the brackets each comprise:
 - a first portion along mounted directly to the at least one elongate mounting member; and
 - a second portion extending forward from the first portion and engaging the forward trim.
3. The apparatus of claim 1 wherein:
 - the at least one light source comprises a plurality of elongate fluorescent light bulbs or a plurality of LED strips.
4. The apparatus of claim 1 further comprising:
 - at least one power line coupled to power the at least one light source.
5. The apparatus of claim 2 wherein:
 - each said first portion is in interlocked engagement with an associated said second portion.
6. The apparatus of claim 5 wherein:
 - each said first portion is in said interlocked engagement with said associated said second portion via a projection captured in a recess.
7. A light apparatus mounted to a surface of a building and comprising:
 - at least one elongate mounting member engaged to the surface;
 - spaced-apart brackets mounted to the at least one elongate mounting member and extending forward therefrom;
 - at least one light source mounted to a plurality of the spaced apart brackets;
 - a forward trim mounted to the spaced-apart brackets;
 - a lower trim mounted to the spaced-apart brackets; and
 - a passageway passing at least one of:
 - a fluid line;
 - an optical fiber;
 - a communications line; and
 - a power line not powering the at least one light source,

wherein the brackets comprise:

- an underside having an aft plurality of upwardly extending recesses and a forward plurality of upwardly extending recesses; and
 - a front having a lower plurality of rearwardly extending recesses and an upper plurality of rearwardly extending recesses.
8. The apparatus of claim 7 wherein:
 - the lower trim comprises a lower wallboard layer screwed to the forward plurality of upwardly extending recesses and the aft plurality of upwardly extending recesses; and
 - the forward trim comprises a forward wallboard layer screwed to the forward plurality of upwardly extending recesses and the aft plurality of upwardly extending recesses.
 9. The apparatus of claim 8 wherein:
 - the lower wallboard layer and the forward wallboard layer each comprise, in majority volume part, cementaceous or fibrous material or combinations thereof.
 10. The apparatus of claim 1 wherein:
 - the passageway is at least partially bounded by a plurality of sheetmetal members spanning multiple said brackets.
 11. The apparatus of claim 10 wherein:
 - the passageway is substantially enclosed top, bottom and front by said plurality of sheetmetal members and contains said power line as a non-low voltage power line.
 12. The apparatus of claim 10 wherein:
 - the passageway is substantially enclosed top and rear but not bottom and front by said plurality of sheetmetal members.
 13. The apparatus of claim 10 wherein:
 - at least one light source comprise modules mounted directly to the brackets.
 14. The apparatus of claim 1 wherein:
 - the at least one elongate mounting member an aluminum alloy extrusion; and
 - the brackets each comprise one or more aluminum alloy extrusions.
 15. The apparatus of claim 1 wherein the at least one light source each comprise:
 - a holding element, comprising:
 - at least one metal support; and
 - at least one receptacle mounted to the support; and
 - at least one ballast.
 16. A light apparatus comprising:
 - at least one light source;
 - first means installable to a building wall for mounting a remainder of the apparatus to the wall;
 - second means mountable to the first means for mounting the at least one light source and a forward trim member and a lower trim member; and
 - third means mounted to the second means for at least partially forming a passageway.
 17. The apparatus of claim 16 wherein the passageway passes at least one of:
 - a fluid line;
 - an optical fiber; and
 - a communications line.
 18. The apparatus of claim 16 further comprising said forward trim member and said lower trim member comprising wallboard.
 19. A light apparatus mounted to a surface of a building and comprising:

at least one elongate mounting member engaged to the
 surface;
 spaced-apart brackets mounted to the at least one elongate
 mounting member and extending forward therefrom;
 at least one light source mounted to a plurality of the 5
 spaced apart brackets;
 a forward wallboard trim mounted to the spaced-apart
 brackets;
 a lower wallboard trim mounted to the spaced-apart
 brackets; and 10
 a passageway passing at least one of:
 a fluid line;
 an optical fiber;
 a communications line; and
 a power line not powering the at least one light source 15
 and of a lower voltage than a power line powering
 the at least one light source.
20. The apparatus of claim **19** wherein the passageway
 passes at least one of:
 the fluid line; 20
 the optical fiber; and
 the communications line.

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